

FCS17- Procedure for Cleaning Glassware

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1. Scope

- 1.1. This document establishes the procedures for cleaning glassware for reuse within the Forensic Chemistry Unit (FCU) laboratory. Cleansing of glassware is a necessity in reuse of volumetric glassware (Class A) for quantitative methods for testing controlled dangerous substances.

2. Background

- 2.1. To establish the practices for documenting the examination of evidence to conform to the requirements of the Department of Forensic Sciences (DFS) Forensic Chemistry Quality Assurance Manual (QAM) and conforms to ISO/IEC 17025 guidelines, and any supplemental standards.

3. Safety

- 3.1. Reagent Toxicity: Personnel should refer to the appropriate SDS for solvents and reagents used during analysis for any specific safety requirements.
 - 3.1.1. For a complete review of required Health and Safety regulations of the Forensic Science Laboratory (FSL), see DOM13 DFS Health and Safety Manual.
- 3.2. Protective Equipment: Personnel should wear personal protective equipment (PPE) including: lab coat, gloves, and safety goggles when carrying out standard operating procedures.

- 3.2.1. Wear vinyl or nitrile gloves when handling these chemicals to prevent absorption through the skin. If any chemicals are spilled onto gloves, discard gloves into hazardous waste.
- 3.3. Personal Hygiene: Universal Precautions must be followed. Care should be taken when handling chemicals or any biological specimen. Routine use of gloves and proper hand washing should be practiced.
 - 3.3.1. Refer to DOM13 – DFS Health and Safety Manual.
- 3.4. Disposal of Waste: Waste materials must be disposed of in compliance with laboratory, Federal, state, and local regulations. Solvents and reagents should always be disposed of in an appropriate container clearly marked for waste products and temporarily stored in a chemical fume hood.
 - 3.4.1. Consult DFS Safety Officer for proper procedures.
- 3.5. General Precautions
 - 3.5.1. Careful handling and storage should be used to avoid damaging glassware.
 - 3.5.2. Inspect the glassware before each use and discard if scratched on inner surfaces, chipped, cracked or damaged in any way.
 - 3.5.3. Use only plastic core brushes that have soft non-abrasive bristles or soft, clean sponges/rags. Use brushes to clean inside of deep glassware.
 - 3.5.4. Do not reach inside of glassware while cleaning to prevent cuts should the glassware break.
 - 3.5.5. Rubber sink and counter mats can help reduce the chance of breakage and resultant injury.
 - 3.5.6. Do not overload sinks or soaking bins.
 - 3.5.7. Do not place metal or other hard objects, such as spatulas, glass stirring rods, or brushes with metal parts, inside the glassware. This will scratch the glass and cause eventual breakage and injury.
 - 3.5.8. Never use strong alkaline products and hydrofluoric acid as cleaning agents. These materials dissolve glass, leading to damage and eventual breakage.
 - 3.5.9. Do not use any abrasive cleansers, including soft cleansers (e.g., Ajax, Comet, Old Dutch, Soft Scrub, etc.), as these will scratch the glass and cause eventual breakage and possible injury. Scotch Brite and similar scouring pads will scratch glass and should not be used.
 - 3.5.10. Do not use heat as a method to remove carbon residues. Heating glassware to temperatures > 800 °F will cause permanent stresses in the glass and eventual breakage.

- 3.5.11. Use proper drying racks for fully cleaned glassware.
- 3.5.12. Tongs, a dustpan, and a broom are the best tools for cleaning up broken glass. If hands are used to pick up glass, only handle large pieces of glass and wear heavy leather gloves to protect the hands. Broken glass must be packaged in labeled, rigid, and sealed containers before disposal.
- 3.5.13. Proper instruction should be provided in the use of glass equipment designed for specialized tasks, which can represent unusual risks for the first-time user.

4. Materials Required

- 4.1. Surfactant of sufficient strength to remove residues and stains on glassware
- 4.2. Scrubbing device, i.e., sponge

5. Standards and Controls

- 5.1. N/A

6. Calibration

- 6.1. N/A

7. Procedures

- 7.1. Types of Cleaning
 - 7.1.1. Cleaning glassware before a chemical reaction is started.
 - 7.1.2. Involves inspection of glassware and cleaning any inadvertent contamination.
 - 7.1.3. Proceed to **CLEANING TYPE 1** in this SOP for further instructions.
 - 7.1.4. Cleaning glassware after a chemical reaction is complete.
 - 7.1.4.1. Involves disposal of unwanted byproducts.

Note – neutralization is done in the waste tanks in the basement of the Consolidated Forensics Laboratory (CFL) building.
 - 7.1.4.2. Proceed to **CLEANING TYPE 2** in this SOP for further instructions.
 - 7.1.5. Stubborn chemical residues and films
 - 7.1.5.1. Verify CLEANING TYPE 1 or 2 does not work.
 - 7.1.5.2. Cleaning specs for metallic or organics that are not easily removed.

7.1.5.3. Proceed to **CLEANING TYPE 3** in this SOP for further instructions.

7.2. **CLEANING TYPE 1: Before Reactions**

7.2.1. Purpose: By inspecting glassware and cleaning any inadvertent contaminations, a safer and more confident reaction can be run.

7.2.2. Pre-Equipment Check - Inspect glassware for damage:

7.2.2.1. Scratches on inner surfaces

7.2.2.2. Chips, dings, holes, star cracks, or anything compromising the integrity of the glassware – **Discard if found.**

7.2.3. Proper Cleaning Procedure – Should only require gentle cleaning

7.2.3.1. Inspect for residue

7.2.3.2. Water spots – Left from common tap water or dried condensation. Distilled or deionized water will remove these.

7.2.4. Chemical deposits – missed from cleaning after reaction

7.2.4.1. For Chemical residue removal

7.2.4.2. Use a detergent solution designed for lab glassware.

7.2.4.3. Soak dirty glassware in a basin of warm lab detergent.

7.2.4.4. Scrub with a good soft brush until removed.

7.2.4.5. Rinse thoroughly with tap water and then with distilled or deionized water.

7.2.4.6. Place on drying rack to air dry

7.2.5. NOTE: Stubborn residues may require a solvent cleaner or a base bath soaking to clean. See **CLEANING TYPE 2** in this SOP for specifics on these instructions.

7.3. **CLEANING TYPE 2: After Reactions**

7.3.1. Purpose: To properly clean contaminated glassware after a reaction is finished. Proper steps for cleaning the glass in the most effective way can be utilized by cleaning after the reaction is finished because the chemical residues are known.

7.3.2. Proper Cleaning Procedure – Should only require gentle cleaning

7.3.2.1. Dispose of the byproduct excess

7.3.3. Water soluble solutions

7.3.3.1. (e.g., salt or sugar solutions).

7.3.3.2. Rinse with tap water and distilled water.

7.3.4. Water insoluble solutions

7.3.4.1. (e.g., solutions in chloroform)

7.3.4.2. Rinse with ethanol or acetone

7.3.4.3. Then rinse with distilled water.

7.3.5. Vacuum greased joints

7.3.5.1. Dissolve by rinsing joints with hexanes.

7.3.5.2. Visually confirm greased joint is clean by observing that the joint has an even frosty look to it before any necessary base bath cleaning.

7.3.6. Place on drying rack to air dry

7.4. **CLEANING TYPE 3:** Stubborn Chemical Residues

7.4.1. Purpose: To properly clean contaminated glassware from stubborn chemical films and residues that CLEANING TYPE 1 AND 2 are incapable of properly removing.

7.4.2. General Precautions

7.4.2.1. Baths are quite hazardous to unprotected skin and especially eyes. Always use eye protection, and thick black gloves when manipulating glassware around the baths.

7.4.2.2. Only glassware should go in the baths, AND, only if glassware is completely glass. No ceramic/glass funnels or things of the like.

7.4.2.3. Rinse gloves after use to prevent spreading solution all over your work area.

7.4.2.4. Base bath can severely damage glass; do not leave soaking any longer than necessary.

7.4.2.5. Always separate glass joints before soaking. A base bath can chemically bond them together permanently.

7.4.2.6. Organic solvent need to be disposed in special waste containers if it is used.

7.4.3. Proper Cleaning Procedure – Should only require gentle cleaning

7.4.3.1. Contaminant is a metal-containing compound (use ACID Bath)

7.4.3.2. Immerse glassware in concentrated hydrochloric acid (HCl) or sulfuric acid (H₂SO₄) till apparent solid has dissolved under the fume hood. **(NOTE: Always put acid into water!)**

7.4.3.3. Rinse with plenty of tap water. (At least 5 times, thoroughly)

7.4.3.4. Final rinse with distilled water or deionized water. (At least 5 times, thoroughly)

- 7.4.3.5. Contaminant is organic (use BASE Bath)
- 7.4.3.6. Soak glassware in a saturated solution of sodium hydroxide or potassium hydroxide in ethanol or isopropanol (BASE Bath).
- 7.4.3.7. Rinse with plenty of tap water.
- 7.4.3.8. Final rinse with distilled water or deionized water.
- 7.4.3.9. *No nuclear resonance (NMR) tube is allowed to wash in base bath. Base can make the tube wall thinner, and such tubes have more potential to shatter.
- 7.4.3.10. Place on drying rack to air dry
- 7.4.3.11. BASE Bath Solution
- 7.4.3.12. Get a large plastic container (~5 gallon)
- 7.4.3.13. Add approximately 200-300g of solid KOH pellets (or NaOH)
- 7.4.3.14. Add 4 L of ethanol (or isopropyl alcohol)
- 7.4.3.15. Carefully add 1L of deionized water
- 7.4.3.16. Leave the plastic container in secondary contain (i.e. sink) until KOH is dissolved and it has cooled back to room temperature before storing.
- 7.4.3.17. Replace cover to plastic container.
- 7.4.3.18. Label container with current date and a sign that says:
"DANGER: BASE-BATH SOLUTION, HIGHLY CAUSTIC!"

8. Sampling

- 8.1. N/A

9. Calculations

- 9.1. N/A

10. Uncertainty of Measurement

- 10.1. N/A

11. Limitations

- 11.1. N/A

12. Documentation

12.1. N/A

13. References

- 13.1. FCS02 – SOP for General Laboratory Procedures for FCU.
- 13.2. Forensic Science Laboratory QAM (current revisions).
- 13.3. ISO/ IEC 17025 (current revision) – General Requirements for the Competence of Testing and Calibration Laboratories, International Organization for Standardization, Geneva, Switzerland.
- 13.4. Glassware Cleaning Standard Operating Procedure, Washington State University (<https://s3.wp.wsu.edu/uploads/sites/172/2016/01/Glassware-Cleaning-Standard-Operating-Procedure.docx>) accessed April 30th, 2018.